PROGRAM REQUIREMENTS

1. General

1.1 This specification is for a cleanroom intended for use over a large thermal vacuum chamber (TVAC) for testing small spacecraft in the EEL (Engineering Evaluation Lab). The cleanroom is required to meet an ISO Class 7 (FED-STD-209 = 10.K) contamination controlled environment.

1.2 The Cleanroom shall meet the requirements stated in ISO 14644-4, Cleanrooms and associated controlled environments.

CLEANROOM ONE

Softwall Shields, Curtains and Doors: *Reference Attachment 2 Cleanroom One Elevations.*

1.3 Non-out gassing material, Static dissipative, polyurethane, Minimum 40 mil. Thickness (Vender to provide test Data)

1.4 Corner or overlap attachment minimizing air leaks.

1.5 Corners designed to ensure a snug fit against frame corners.

1.6 Mounting System should be single piece track, made of rigid polyethylene, hinged with bottom flanges. Noncorrosive and easy to clean.

1.7 Clear Strip Shields: 4'wide, comprised of 8" wide strips with min of 2" overlap, actual length shall be determined design opening.

1.8 Clear Curtain Panels: 4' wide, where curtains meet, panels shall overlap by min of 6" actual length shall be determined by design opening.

1.9 Strip Doors: 6' width, comprised of 8" wide alternating clear with frosted strips at 2" min. overlap, actual length shall be determined by design opening.

2. General Requirements: *Reference Attachment 2 Cleanroom One Elevations.*

2.1 ISO Class 7 (10.K Fed. Standard 209), laminar airflow design.

2.2 Provide a means for ESD (electro static discharge) control, i.e. ionizer(s).

2.3 FFU (Fan Filter Unit) and task lights shall be provided.

2.4 Differential pressure gauge shall be installed, with both local and remote (i.e. RS-232 Port or equivalent) indicators.

2.5 Monitoring sensors and equipment shall be prewired to a central control panel.

2.6 Cleanroom shall be maintained at positive air pressure relative to that of the nominal EEL High Bay environment.

2.7 Low Hydrocarbons: total hydrocarbons for the empty, at rest, room shall not exceed 15 ppm, methane equivalent when measured by Flame or Photo Ionization Detector (FID or PID). The hydrocarbon deposition on an aluminum foil, or equivalent, substrate shall not exceed 0.2 mg/ft^2 per month.

2.8 Low out gassing materials

2.9 Modular to adapt to changing requirements and GSE placement.

2.10 Test support equipment Cable access.

2.11 No impact to EEL facility HVAC temperature.

2.12 Noise less than 65 db.

2.13 No silicones

2.14 Filters tested w/out DOP (Dioctyl Phthalate)

3. Cleanroom Certification and As Built

3.1 Functional and physical verification against procurement document requirements of completed Cleanroom shall be conducted as a part of the acceptance process.

3.2 Following successful verification, the Cleanroom shall undergo independent certification for ISO Class 7 compliance; i.e., also part of system acceptance.

3.3 Certification document shall be delivered to NASA Procurement.

3.4 Document "as built" and provide 2 each Cleanroom User Manuals and Manufacturing Data Reports.

4. Detailed Requirements

4.1 Dimensions: Height from floor to FFU interior face, 10 feet (& through side openings), Width (interior) 14 feet, Length (interior) 18 feet. Maximum exterior height not to exceed 11 feet (critical for TVAC bell lift operations above cleanroom)

4.2 Structure shall be movable through use of casters with brakes and swivel lock features and made of non-marring treat material.

4.3 Laminar flow design.

4.4 Structure shall be capable of resisting the seismic criteria of CBC 2001 for Seismic Zone 4, soil profile factor SD. Site is located 13 Kilometers to seismic source type A and 8 Kilometers to seismic source type B.

4.5 Ceiling system must meet the requirements for seismic bracing of **(example)** UBC Standard 25-2, which are described in the following Interpretation of Regulation IR 25-2 published by the State of California.

5. Clean Room Fan Filter Units (Typical) (Ref: FED STD 209)

5.1 Low energy, 200 Watts maximum at 90 +/- 30ft/min airflow velocity.

5.2 Speed control: Solid state adjustable. This control shall be located in a control panel outside the clean room.

5.3 Filter: Non-DOP HEPA with 99.99% rating for 0.3 micron or larger particulate removal.

5.4 Airflow (CFM±10%): 650 at 90ft/min air flow velocity.

5.5 Sound level: @ average airflow velocity of 90 FPM: 50 dBA. At high speed, the airflow shall be increased to 750 cfm at 105ft/min airflow velocity.

5.6 Filter replacement from outside clean room is expected.

6. Air Flow

6.1 Air flow rate: 100 to 140 ft/min.

6.2 Air flow volume: minimum of 650 cfm.

6.3 Air changes: minimum of 62 ach/hr.

6.4 Differential pressure: shall exceed by 1X = 0.0108 psi (0.03 in. H_2O)

7. Lighting

7.1 General overhead task lighting shall be provided.

8. Control Panel, 1 each *Reference Attachment 2 Cleanroom One Elevations.*

8.1 Houses:

8.1.1 Air pressure gauge, alarmed. (ref: 16.1)

8.1.2 Air velocity indicator, alarmed.

8.1.3 Switches for lights

8.1.4 Switch and speed controller for Fan Filter Units

9. Electrical Services

9.1 Electrical services (such as power for fan filter units, lights and ceiling cover) for the cleanroom shall be prewired and shall terminate at a central power panel mounted on the East wall outside the clean room.

9.2 A single main electrical power cord will be extended from the cleanroom power panel to an EEL building facility receptacle outlet. Electrical service connectivity details will be worked out between the vendor and NASA Ames.

10. Electrical Power

10.1 120/208 VAC, 3ø, **TBD** A, 60 Hz - Fan Filter Unit (Vendor to propose detail power draw)

10.2 120 VAC, 1ø, **TBD** A, 60 Hz - lighting/instrumentation/utility power (Vendor to propose detail power draw)

10.3 Power Distribution (Circuit Breaker) Box, Exterior Mount, East wall.

11. Differential Pressure switch/gauge, Photohelic, 1 each

11.1 Meets FED Std 209E

11.2 Accuracy: 2% full scale

11.3 Pressure range: 0 - 4.0”WG